

includes a detection device shown generally at 51. The first section containing the gas mixing and ionizing chamber 49 is attached to the outlet end of pipe 29 for receiving the 5 incoming gas sample to be tested. The gas mixing and ionizing chamber is defined by an open ended cylinder 53 which has affixed thereto a radiation source in the form of discrete radiation emitting elements 55. The 10 upstream end of the cylinder is separated from the pipe 29 by means of an end wall 57 having an inlet nozzle 59 formed therewith to impart a turbulent flow to the incoming gas sample as it enters the chamber 15 49.

The detector section 43 includes a cylindrical collector electrode 61 having apertures 63 at one end thereof to admit ionized gas. Voltage is applied to a central electrode 65 from a suitable voltage source 67 to produce a gradient which will cause the gas ions to move toward the collector electrode 61, and produce a current which is measured by an electrometer amplifier 37. 25 The gas flows through an outlet 71 and then to pipe 31 whereupon it is either routed back into the dynamoelectric machine or sent to a suitable vent. A wall 73 separates the gas mixing and ionizing chamber 49 30 from the detector section 43 except for the collector electrode 61. Reference again is made to U.S. Patent 3,573,460 to Skala for a general description of an ion chamber detector not including the improved construction of the present invention. 35

The ion chamber detector is improved by the present invention to great advantage for operation with a large gas cooled dynamoelectric machine by providing a heating 40 means in combination with the ion chamber detector. The heating means is applied to the first section housing the gas mixing and ionizing chamber for the purpose of heating the ionizing gas to a temperature which will 45 gasify more volatile non-pyrolylate particulates such as oil mist particles. The heating means may take the form of a band heater 81 which is applied to the outside circumference of the first section 41. Such a band heater is available from the Ogden Company 50 under the designation HB455L50X (120V 890W). Heat control of the band heater is achieved by a thermostat 85 which may include a surface temperature feedback to the 55 thermostat along line 87 from a thermocouple 88.

Heating the gas mixing and ionizing section is better than heating the incoming gas sample upstream from the ion chamber 60 detector as, for example, by applying a band heater around pipe 29. This construction is less preferred since the gasified non-pyrolylate particulates may be condensed as they reach the ion chamber detector if it is 65 at ambient temperature. It would also be

possible to provide a heat source within the ion chamber detector, but this is deemed to be less attractive in terms of simplicity of construction of the present invention.

In discussing the background of the invention, it was stated that according to U.S. Patent 3,427,880 to Grobel et al certain portions of a gas cooled dynamoelectric machine may be coated with selected polymeric compositions which will decompose at elevated temperatures to produce decomposition products called pyrolylates. The detected decomposition of these selected polymers will give advance warning of localized overheating within the dynamoelectric machine. Coating polymers are selected on the basis of machine operating conditions. If it is desired that a relatively high temperature be allowed before an indication is given, it may be preferable to utilize the normal coating applied to the laminations, for example, the phenolformaldehyde polymer. This polymer will commence to give off decomposition particles in the neighborhood of 250°C in a pressurized hydrogen atmosphere. Actually, such continued decomposition of the normal lamination coating would lead to damage of the type which it is desired to prevent. Therefore, if preferred, special polymeric materials decomposing at lower temperatures than those which would damage the insulation or other parts of interest may be applied over the previously mentioned coating. These can be applied in areas of particular concern such as the tips of the stator teeth or inside the slot walls or on the duct spaces. The latter would give an indication of localized high temperature in the cooling ducts or around the stator teeth. Such coating materials employed to give advance warning of potential local damaging temperatures may comprise polyalpha-methylstyrene, polystyrene, polymethyl methacrylate or cellulose propionate. These decompose and give off submicron decomposition particles rather abruptly as temperatures in the range of 165–190°C are reached in pressurized hydrogen. Other materials emitting decomposition particles at even lower temperatures are feasible. However, the pyrolylate particles that are produced are not gasified to a significant extent in the operating temperatures of the heated ion chamber.

On the other hand, a typical hydrogen seal oil used in large gas cooled dynamoelectric machines will produce an oil mist at temperatures as low as 124°C. It is determined by experiment that a typical oil mist could be gasified at a temperature of about 150°C. Since the gas temperature in the ionization chamber of the present invention is raised to the range of 150°C to 250°C, the more volatile non-pyrolylate oil-mist

particles will be gasified prior to entering the detector section and there will be no false signal due to non-pyrolysate products. If the temperature is raised too high, some 5 of the less volatile pyrolysate components could begin to gasify depending upon the selected polymeric material. Therefore, according to the objects of the present invention the more volatile non-pyrolysate 10 materials will be gasified prior to entering the detector section whereas the less volatile pyrolysates from selected polymeric materials will be unaffected whereby only those selected pyrolysates will cause a signal 15 on the ion chamber detector giving an accurate warning of machine overheating. It has further been found that in the preferred embodiment, the band heater can be controlled by feedback thermocouple 88 to 20 maintain the temperature of the ionized gas in the temperature range of 150°C. These temperature ranges are selected on the basis of a typical gas cooled dynamoelectric machine using typical polymeric coatings 25 and hydrogen seal oils.

It has also been found that prior art radiation sources such as thorium impregnated rayon mantles become fragile and brittle after being subjected to the elevated 30 temperatures of the hot ion chamber detector. In the environment of a large dynamoelectric machine and over prolonged usage at elevated temperatures it is possible that the rayon mantle would deteriorate due 35 to rough handling or vibrations.

Accordingly, the present invention may employ a thermally stable radiation source such as radioactive thorium 232 in the form of pieces of thorium oxide ceramic dis- 40 tributed over a metal cylindrical surface. Referring to Figure 2, the thorium oxide ceramic may be in the form of discrete button-like elements 55 distributed over a wire mesh cylindrical screen wherein the 45 buttons are applied to the screen by means of suitable fasteners 56. These thorium oxide ceramic elements are applied uniformly over the axial length of the gas mixing and ionizing chamber. The wire mesh 50 screen may be stainless steel or alternatively a Nichrome® metal sheet may be employed. Another alternative radiation source can be in the form of a cylinder consisting of a thorium oxide-yttrium oxide ceramic.

WHAT WE CLAIM IS:—

1. An apparatus for use in detecting the presence of pyrolysates in a gaseous carrier, said gaseous carrier being a coolant gas sample from a gas cooled dynamoelectric machine wherein certain machine parts are 60 coated with selected materials which will decompose at an elevated temperature to produce said pyrolysates indicative of localized overheating of dynamoelectric machine parts; said apparatus comprising an outer shell including a gas mixing and ionizing section and a detector section, said detector section being arrayed to receive an ionized gas sample from said gas mixing and ionizing section, said detector section including spaced electrodes having a voltage applied thereto and between which current flow occurs by means of the ionized gas to produce a variable signal the magnitude of which is proportional to the current flow; and further including 70 heater means applied to the gas mixing and ionizing section, said heater means providing a temperature range of from 150°C to 250°C within the gas mixing and ionizing section whereby oil mist particles from the dynamoelectric machine may be gasified without affecting pyrolysates in the gaseous carrier; and, 75 a radiation source within said gas mixing and ionizing section comprising a plurality of discrete radioactive ceramic elements supported in said gas mixing and ionizing section. 80

2. An apparatus according to claim 1, further comprising 90 a cylindrical wire mesh support element disposed within said outer shell in the gas mixing and ionizing section; and wherein said radiation source comprises 95 a plurality of discrete radioactive elements of thorium 232 oxide ceramic attached along the axial length of said support element.

3. An apparatus for use in detecting the presence of pyrolysates in a gaseous carrier, substantially as hereinbefore described with reference to and as shown in the accompanying drawings. 100

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Agent for the Applicants

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COMPLETE SPECIFICATION

1 SHEET

This drawing is a reproduction of
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Fig. 1

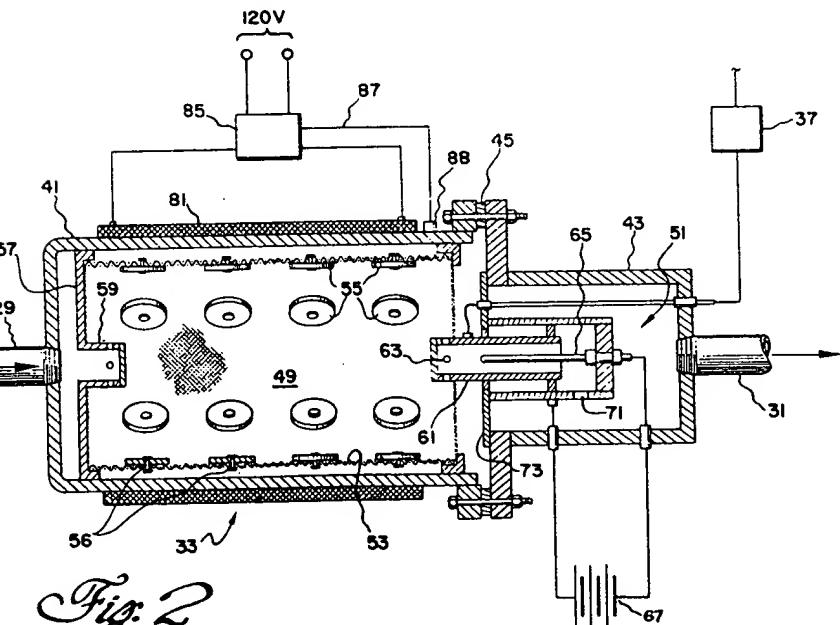
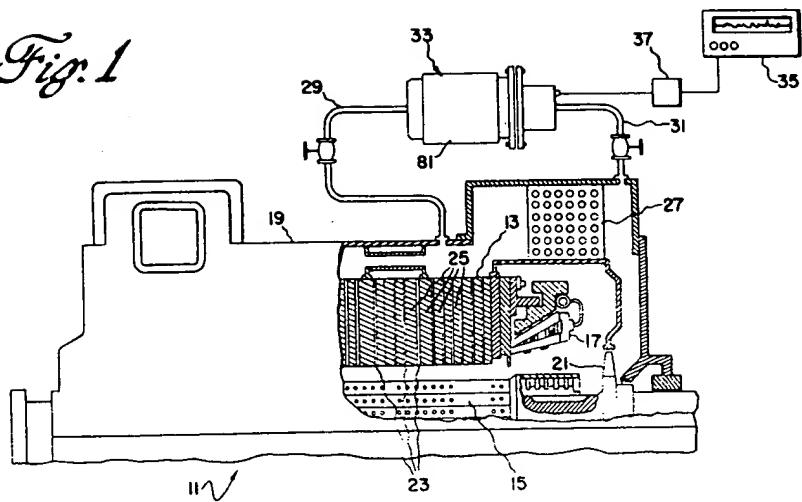


Fig. 2

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APPL PARTS

IMIS	
Internal Misc. Paper	
LET.	
Misc. Incoming Letter	
371P	
PCT Papers in a 371 Application	
A...	
Amendment Including Elections	
ABST	
Abstract	
ADS	
Application Data Sheet	
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Affidavit or Exhibit Received	
APPENDIX	
Appendix	
ARTIFACT	
Artifact	
BIB	
Bib Data Sheet	
CLM	
Claim	
COMPUTER	
Computer Program Listing	
CRFL	
All CRF Papers for Backfile	
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Terminal Disclaimer Filed	
DRW	
Drawings	
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Foreign Reference	
FRPR	
Foreign Priority Papers	
IDS	
IDS Including 1449	

NPL		CTNF	
Non-Patent Literature		Count Non-Final	
OATH		CTRS	
Oath or Declaration		Count Restriction	
PET.		EXIN	
Petition		Examiner Interview	
RETRMAIL		M903	
Mail Returned by USPS		DO/EO Acceptance	
SEQLIST		M905	
Sequence Listing		DO/EO Missing Requirement	
SPEC		NFDR	
Specification		Formal Drawing Required	
SPEC NO		NOA	
Specification Not in English		Notice of Allowance	
TRNA		PETDEC	
Transmittal New Application		Petition Decision	

OUTGOING

CTMS	
Misc. Office Action	
1449	
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892	
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APDEC	
Board of Appeals Decision	
APEA	
Examiner Answer	
CTAV	
Count Advisory Action	
CTEQ	
Count Ex parte Quayle	
CTFR	
Count Final Rejection	

INCOMING

AP.B	
Appeal Brief	
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Change of Address	
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Notice of Appeal	
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Change in Power of Attorney	
REM	
Applicant Remarks in Amendment	
XT/	
Extension of Time filed separate	

File Wrapper

FWCLM	
File Wrapper Claim	
IIFW	
File Wrapper Issue Information	
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File Wrapper Search Info	

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SRNT	
Examiner Search Notes	
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PTO Prepared Complete Claim Set	

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WCLM	
Claim Worksheet	
WFEE	
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